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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/029,021	12/20/2001	Atiya M. Ahmad	V200-0833 (VGT 0206 PA)	3259
7590 09/22/2005			EXAMINER	
Thomas E. Donohue Suite 250 28333 Telegraph Road Southfield, MI 48034			ALHIJA, SAIF A	
			ART UNIT	PAPER NUMBER
			2128	

DATE MAILED: 09/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/029,021

Applicant(s)

AHMAD ET AL.

Examiner

Saif A. Alhija

Art Unit

2128

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 December 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-20 have been presented for examination based on the application filed on 20 December 2001.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claim(s) 1-6, 8-12, 14-15, 17-18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kulischenko et al. "Safeness Indicator for Flexible Shafts Used in Automotive Steering Mechanisms" U.S. Patent No. 4,398,173**, hereafter referred to as "**Kulischenko '173**" in view of **Koyo Seiko "Improvement of Steering Performance and Vehicle Stability through the Development of Steer-by-Wire Technology"**, hereafter referred to as **Seiko**.

Regarding Claim 1:

Kulischenko '173 discloses, a simulated steering assembly comprising: a flexible steering column shaft; and a control feature in communication with said free rotational end. (**Kulischenko '173, Column 1, Lines 28-32, and 54-57**)

Kulischenko '173 however does not disclose, a flexible **polymer** steering column shaft **having a fixed end and a free rotational end**.

Seiko however discloses a steering column shaft having a fixed end and a free rotational end. (**Seiko, Page 2, Figure**)

It would also have been obvious to a person of ordinary skill in the art at the time of the invention to utilize a steering column shaft having a fixed end and a free rotational end, as discussed in **Seiko**, in conjunction with the steering assembly discussed in **Kulischenko '173** in order to allow for further Steer-by-Wire variations and improvements.

Kulischenko and Seiko, however do not disclose a flexible polymer.

However the use of a flexible polymer is well known in the art in order to allow for the flexibility of the shaft.

Thus, it would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize a flexible polymer, or any other flexible material, for the flexible steering column shaft, as discussed in **Kulischenko '173**.

Regarding Claim 2:

Kulischenko '173 discloses, A simulated steering assembly as described in claim 1 wherein said control feature is a steering wheel. (**Kulischenko '173, Column 1, Lines 54-57. Figure 1, Element 16**)

Regarding Claim 3:

Kulischenko '173 discloses a simulated steering assembly as described in claim 1 further comprising: an electroactive assembly in communication with said flexible polymer steering column shaft;

and a control module in electronic communication with said electroactive assembly. (**Kulischenko '173, Column 1, Lines 48-63**)

Regarding Claim 4:

Kulischenko '173 discloses a simulated steering system assembly as described in claim 3 wherein said electroactive assembly comprises at least one sensor. (**Kulischenko '173, Column 1, Lines 48-63**)

Regarding Claim 5:

Kulischenko '173 discloses A simulated steering system assembly as described in claim 3 wherein said electroactive assembly comprises at least one piezoceramic device. (**Kulischenko '173, Column 1, Lines 48-63**)

Regarding Claim 6:

Kulischenko '173 and Seiko do not disclose A simulated steering assembly as described in claim 3 wherein said electroactive assembly can adjust the modulus of said flexible polymer steering column shaft.

However, it would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize an electroactive device in conjunction with the piezoceramic device as discussed in **Kulischenko '173** in order to adjust the modulus of the steering column shaft. Such use of the electroactive device in conjunction with the piezoceramic device is well known based on the definition of a piezoceramic device in which a piezoceramic device, subjected to applied voltage, can alter its physical characteristics.

Regarding Claim 8:

Kulischenko '173 discloses a simulated steering assembly as described in claim 3 wherein said electroactive assembly is embedded in said flexible polymer steering column shaft. (**Kulischenko '173,**

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Column 1, Lines 48-63)

Regarding Claim 9:

Kulischenko '173 discloses A simulated steering assembly comprising:

a flexible steering column shaft; (**Kulischenko '173, Column 1, Lines 28-32, and 54-57)**

a steering wheel in communication with said rotationally free end; (**Kulischenko '173, Column 1,**

Lines 54-57. Figure 1, Element 16)

and an electroactive assembly in communication with said flexible steering column shaft.

(**Kulischenko '173, Column 1, Lines 48-63)**

Kulischenko '173 however does not disclose, a flexible polymer steering column shaft having a fixed end and a free rotational end.

Seiko however discloses a steering column shaft having a fixed end and a free rotational end.

(**Seiko, Page 2, Figure)**

It would also have been obvious to a person of ordinary skill in the art at the time of the invention to utilize a steering column shaft having a fixed end and a free rotational end, as discussed in **Seiko**, in conjunction with the steering assembly and electroactive assembly discussed in **Kulischenko '173** in order to allow for further Steer-by-Wire variations and improvements.

Kulischenko and Seiko, however do not disclose a flexible polymer.

However the use of a flexible polymer is well known in the art in order to allow for the flexibility of the shaft.

Thus, it would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize a polymer, or any other flexible material, for the flexible steering column shaft, as discussed in **Kulischenko '173**.

Regarding Claim 10:

Kulischenko '173 discloses A simulated steering assembly as described in claim 9 further comprising: steering mechanisms; and a control module in electronic communication with said

electroactive assembly and controlling said steering mechanisms in response to signals from said electroactive assembly. (**Kulischenko '173, Column 1, Lines 48-63**)

Regarding Claim 11:

Kulischenko '173 discloses A simulated steering assembly as described in claim 9 wherein said electroactive assembly comprises at least one sensor. (**Kulischenko '173, Column 1, Lines 48-63**)

Regarding Claim 12:

Kulischenko '173 discloses A simulated steering assembly as described in claim 9 wherein said electroactive assembly comprises at least one piezoceramic device. (**Kulischenko '173, Column 1, Lines 48-63**)

Regarding Claim 14:

Kulischenko '173 and Seiko do not disclose A simulated steering assembly as described in claim 9 wherein said electroactive assembly can adjust the modulus of said flexible polymer steering column shaft.

However, it would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize an electroactive device in conjunction with the piezoceramic device as discussed in **Kulischenko '173** in order to adjust the modulus of the steering column shaft. Such use of the electroactive device in conjunction with the piezoceramic device is well known based on the definition of a piezoceramic device in which a piezoceramic device, subjected to applied voltage, can alter its physical characteristics.

Regarding Claim 15:

Kulischenko '173 discloses A simulated steering assembly as described in claim 9 wherein said at least one sensor element senses a degree of twist of said flexible polymer steering column shaft. (**Kulischenko '173, Column 1, Lines 48-63**)

Regarding Claim 17:

Kulischenko '173 discloses utilizing a control feature and a flexible steering column shaft; measuring the rotation of the flexible polymer steering column shaft using an electroactive assembly in communication with said flexible steering column shaft. (**Kulischenko '173, Column 1, Lines 28-32, and 48-63. Figure 1, Element 16**)

Kulischenko '173 does not disclose a method of controlling a steer-by-wire assembly, a flexible polymer steering column shaft **having a fixed end and a free rotational end**, rotating the free rotational end in response to a driver moving said control feature; and activating a steering mechanism in response to said electroactive assembly.

Seiko, however, discloses a method of controlling a steer-by-wire assembly, a steering column shaft **having a fixed end and a free rotational end**, rotating the free rotational end in response to a driver moving said control feature; and activating a steering mechanism in response to said electroactive assembly. (**Seiko, Page 2, Figure**)

It would also have been obvious to a person of ordinary skill in the art at the time of the invention to utilize a steering column shaft having a fixed end and a free rotational end which rotates in response to driver movement and activates a steering mechanism in response to driver movement, as discussed in **Seiko**, in conjunction with the steering assembly and electroactive assembly discussed in **Kulischenko '173** in order to allow for further Steer-by-Wire variations and improvements.

Kulischenko and Seiko, however do not disclose a flexible polymer.

However the use of a flexible polymer is well known in the art in order to allow for the flexibility of the shaft.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize a polymer, or any other flexible material, for the flexible steering column shaft, as discussed in **Kulischenko '173**

Regarding Claim 18:

Kulischenko '173 and Seiko do not disclose A method as described in claim 17 further comprising: adjusting the modulus of said flexible polymer steering column shaft utilizing said electroactive assembly to provide feedback to said driver.

However, it would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize an electroactive device in conjunction with the piezoceramic device as discussed in **Kulischenko '173** in order to adjust the modulus of the steering column shaft. Such use of the electroactive device in conjunction with the piezoceramic device is well known based on the definition of a piezoceramic device in which a piezoceramic device, subjected to applied voltage, can alter its physical characteristics.

Regarding Claim 20:

Kulischenko '173 discloses A method as described in claim 17 wherein said electroactive assembly includes a solid polymer composite bundle embedded in said flexible polymer steering column shaft. (**Kulischenko '173, Column 1, Lines 48-63**)

6. **Claim(s) 7, 16 and 19 is rejected under 35 U.S.C. 103(a)** as being unpatentable over **Kulischenko '173 in view of Seiko, as applied to claims 3, 9 and 17, and further in view of Serizawa et al. "Vehicle Steering Control System", U.S. Patent No. 5,347,458 hereafter referred to as "Serizawa".**

Regarding Claim 7:

Kulischenko and Seiko do not disclose a simulated steering assembly as described in claim 3 wherein said electroactive assembly imparts road feel on said flexible polymer steering column shaft.

Serizawa, however, discloses a simulated steering assembly as described in claim 3 wherein said electroactive assembly imparts road feel on said flexible polymer steering column shaft. (**Serizawa, Column 2, Lines 1-4**)

It would have been obvious to a person of ordinary skill in the art at the time of the invention to provide road feel information through the steering column, as disclosed in **Serizawa**, for the steering assembly discussed in **Kulischenko and Seiko** in order to allow for normal driving feel and feedback.

Regarding Claim 16:

Kulischenko and Seiko do not disclose a simulated steering assembly as described in claim 9 wherein said electroactive assembly imparts road feel on said flexible polymer steering column shaft.

Serizawa, however, discloses a simulated steering assembly as described in claim 9 wherein said electroactive assembly imparts road feel on said flexible polymer steering column shaft. (**Serizawa, Column 2, Lines 1-4**)

It would have been obvious to a person of ordinary skill in the art at the time of the invention to provide road feel information through the steering column, as disclosed in **Serizawa**, for the steering assembly discussed in **Kulischenko and Seiko** in order to allow for normal driving feel and feedback.

Regarding Claim 19:

Kulischenko and Seiko do not disclose a method as described in claim 17 further comprising: removing modal resonances of said flexible polymer steering column shaft.

Serizawa, however, discloses a method as described in claim 17 further comprising: removing modal resonances of said flexible polymer steering column shaft. (**Serizawa, Column 1, Lines 38-40**)

It would have been obvious to a person of ordinary skill in the art at the time of the invention to remove modal resonances as discussed in **Serizawa** in order to allow for refined steering in the steering assembly discussed in **Kulischenko and Seiko**.

7. **Claim(s) 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kulischenko '173 in view of Seiko, as applied to claim 9, and further in view of Steiner et al. "Flexible Steering Column" U.S. Patent No. 3,165,942 hereafter referred to as "Steiner."**

Regarding Claim 13:

Kulischenko and Seiko do not disclose a simulated steering assembly as described in claim 9 further comprising: at least one guide element in communication with said flexible polymer steering column shaft and minimizing non-rotational deflections of said flexible polymer steering column shaft.

Steiner, however, discloses a simulated steering assembly as described in claim 9 further comprising: at least one guide element in communication with said flexible polymer steering column shaft and minimizing non-rotational deflections of said flexible polymer steering column shaft. (**Steiner, Figure 2, Column 3, Lines 4-6**)

It would have been obvious to a person of ordinary skill in the art at the time of the invention to provide a guide for the steering column as discussed in **Steiner**, in order to prevent unwanted movement of the steering column and prevent a safety or control hindrance for the steering assembly discussed in **Kulischenko and Seiko**.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

These references include:

A) "Piezoelectric Ceramics Characterization", T.L. Jordan, NASA Langley Research Center, Hampton, Virginia. Z. Ounaies, ICASE, Hampton, Virginia. September 2001.

B) Hardmark et al. "Flexible Shaft" U.S. Patent No. 3,940,945

C) Serizawa et al. "Vehicle Steering Control System", U.S. Patent No. 5,251,135

7. All Claims are rejected.

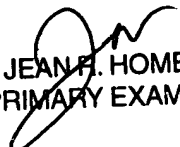
8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Saif A. Alhija whose telephone number is (571) 272-8635. The examiner can normally be reached on M-F, 11:00-7:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jean Homere can be reached on (571) 272-3780. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SAA

September 14, 2005


JEAN H. HOMERE
PRIMARY EXAMINER